

WORK AND PROGRESS OF THE IMPERIAL GEOLOGICAL INSTITUTE OF VIENNA¹

I. *THE Staff* has its full complement. M. D. Stur has been appointed sub-director, Dr. O. Lenz has returned from Africa with much information on the West Coast. M. Pilide, volunteer since 1875, has been appointed official geologist in Roumania. Two volunteers have joined, and there are four students in the museum and laboratory.

II. *The Building* has been considerably altered and enlarged, giving more space for laboratory, library, and museum.

III. *The Survey Operations* have been directed to (1) *the Special Map of the Empire*. Section 1. MM. Stache and Teller surveying the Central Alps south and east from the Cividale massif, the Oetzthal massif, &c. 2. MM. von Mojsisovics, Vacek, and Bittner—the Cima d'Asta, Sette Comuni, and eastward to the Venetian plain, the Tertiaries of the Vicentin, and down to the valley of the Adige. 3. MM. Paul, Tietze, and Lenz, East Galicia and part of N.E. Hungary.

(2). *Local Surveys, &c.*, D. Stur—Review of Sternberg's and Corda's collections of Carboniferous Plants in the Prague Museum; Coal-bed of Upper Silesia; Fossil Plants of Lunz in Upper Austria. Stache—Palæozoic Schists of the Semmering on the Styrio-Austrian frontier. Von Mojsisovics—Trias in Upper Austria and Carinthia. Wolf—Railway Line in Upper Austria. Paul and Fr. Ritter von Hauer—Coal-beds of Aspang and Kladno. Bittner—Geological Map of the Archduke Leopold's Estates South of Vienna.

(3). *With Government Aid*, R. Hoernes—Devonian Strata near Gratz, Styria. Koch—Rhaeticon and Selvetra group.

(4). *The Bohemian Commission*.—Krejci and Helmacker—The Silurians of Central Bohemia. Laube—The Erzgebirg between Bohemia and Saxony. Fritsch—Palæozoic Saurians and Crustacea of Beraun. Nowak—Cypris-shales with Insects. Boritzky—Porphyries.

5. *Hungarian Geological Survey*.—Banat and South and West Hungary, surveyed by MM. Hofmann, Roth, Matiasovics, Boeckh, and Hantken.

IV. *Rearrangement of and additions to, the Museum*. Forty-one donors. Above 1,000 specimens, presented by Fr. Karrer, illustrative of the geology and fossils of the region traversed by the Francis-Joseph Aqueduct from the slopes of the Schneeberg to Vienna.

V. *Library*.—1. *Books*: Increase of 270 works in 281 volumes or parts; Periodicals, 422 volumes. Total at the close of 1877, 8,346 work in 22,496 volumes or parts; 766 Periodicals and Transactions in 13,261 volumes or parts. Various new Exchanges. 2. *Maps*: Arrangement completed. Total at the close of 1877, 933 in 3,825 sheets, besides the original maps by the Institute, and the special general maps of the Austro-Hungarian Empire reduced from them.

VI. *Laboratory*.—Newly established in a fresh locality. Enlargement of collection of artificial crystals, by Karl Ritter von Hauer. Analysis of eruptive rocks of the Ortler mountain-group, by M. John. Analyses of fossil fuel, ores, building-materials, &c.

VII. *Publications*.—1. The Transactions, vol. vii. part IV., and vols. viii. and ix., with fifty-four maps, sections, and plates, comprising Vacek's paper on the Mastodons of Austria; F. Karrer's Geology of the Francis-Joseph Aqueduct; and Stur's description of the Culm-flora. 2. The Annals: Ten contributors. 3. The Mineralogical Communications; Twenty-two contributors. These papers will for the future be published by themselves. 4. The Proceedings: Twenty-six contributors. 5. Other publications: MM. von Hauer and Neumayr's Guide for

the Meeting of the German Geologists; M. Stache's Geological Map of the Maritime region of Austria; Fr. von Hauer's "Geology," second edition.

METEOROLOGICAL NOTES

DR. OTTO KRÜMMEL publishes a paper in the current number of the journal of the *Gesellschaft für Erdkunde* of Berlin, on the distribution of the rainfall of Europe, illustrated by a well-executed map of seven colours, which show the regions where the annual rainfall does not exceed 9·8 inches (25 ctm.), is from 9·8 to 15·7 inches, from 15·7 to 21·7 inches, &c., the deepest tint covering all those regions where the rainfall exceeds 39·4 inches (100 ctm.). The map exhibits in a striking manner the small rainfall in the east and the heavy rainfall in the west; the markedly reduced rainfall of such mountain-sheltered plains as those which surround Paris, Clermont, Mannheim, Prague, Pressburg, and the great plain of Hungary; the large rainfall of the slopes of the Caucasus, which stands out in strong contrast with that of the arid regions all round; and the exceptional rainfall of Spain, which presents on the map a picturesque patchwork of all the seven colours representative of the wettest down to the driest regions portrayed on the map. The most important feature, however, is the partition of Europe into two divisions, by a wavy line lying about the forty-third degree of latitude, the southern division being characterised by a rainless or all but rainless summer, and the northern by rain all the year round, where an absolutely rainless month is of rare occurrence. Slight exception may be taken to the rainfall set down for Iceland, Holland, and portions of the east of Scotland and west of Norway, as being a little too large, but on the whole the map is an admirable piece of work.

DR. HORNSTEIN, of Prague Observatory, has discussed the observations of the wind made there from 1849 with a Kreil's anemometer, and the results, which have been communicated to the Vienna Academy, disclose periodicities of velocity and direction generally accordant with Wolf's relative numbers of the sun-spots and with the well-known secular variation of the aurora. The mean annual velocity increases from the period of minimum to that of maximum sun-spots, and thence decreases with the diminution of the sun-spots to the minimum; and from the period of maximum to that of minimum sun-spots, the mean annual direction of the wind changes from a westward to a more southerly direction, while the change is in the opposite direction from the minimum to the maximum sun-spot period.

MR. BLANFORD, the Government Meteorologist for India, published quite recently a forecast of the weather of the monsoon season now set in. Reasoning from the unusually persistent high pressure then prevailing over Northern India, the singular absence of abnormal variations of pressure over the same region, and the heavy rainfall during the cold weather, he thinks it probable that the monsoon current will be below its average strength, that the rainfall will be more equally distributed than last year, and that the monsoon will commence later than usual in Upper India.

ON the occasion of the commemoration of the 400th anniversary of the founding of Upsal University in September last, the Swedish Government published an Atlas of fifty-one maps which had been prepared by Prof. Hildebrandsson to show the direction of the upper currents of the atmosphere during 1875 and 1876. About the same time the Meteorological Society (London) published thirty weather maps for March, 1876, prepared by Mr. Clement Ley, in illustration also of the upper currents. As regards the broad results arrived at, both authors are substantially agreed, the results being that while the surface winds blow inwards upon cyclonic areas

¹ From Fr. Ritter von Hauer's Annual Report, January 8, 1878.

of low pressure and outward from anticyclones, the upper currents blow away from cyclonic and inwards upon anticyclonic areas. The most striking part of Mr. Ley's paper is the diagram in which he has summarised with no small amount of skill the facts of his cirrus-cloud observations. The point in the diagram is this: if the upper currents there depicted are to be regarded as tolerably close approximations to the movements of the cirrus-clouds of a cyclone, it follows that the region of the cirrus occupies a much higher level over the front portion of cyclone than it does over its rear—notably than over the north-west quadrant—a point of prime importance in relation to the theory of storms.

THE energetic way in which the Missouri (U.S.) weather service is being conducted may be judged of from the fact of the Report of the weather of May having reached us by post on June 24. This Report gives a statement of the rainfall for the month at from sixty to seventy stations, a map showing the distribution of the rainfall over the State for May, and a rapid sketch of the chief features of the weather. The rainfall was greatest in the central-southern districts, amounting to 8.00 inches at Bolivar, and least in the north-east, where at Canton it was only 1.77 inch. The increased efficiency of the system is well shown by the fulness with which the great storm of the 17-18th with its accompanying thunder and lightning and locally-developed whirlwinds has been accurately observed over Missouri, of which Director Nipher promises a full report. A separate sheet accompanies the Report, with all the instances of heavy rainfalls which have occurred during the past thirty years. Of these the most noteworthy as regards rate of fall was a downpour of 5.05 inches in an hour and-a-quarter on August 15, 1848. The heaviest continuous fall was 7.83 inches during thirty hours on June 18-20, 1859.

WE learn from the Mauritius Meteorological Report for 1876 that the rainfall of the whole island during that year was 12.63 inches less than the average, and that daily observations are now received from Seychelles, Rodrigues, and others of the neighbouring groups of islands. Valuable tables appear in the Report, showing the monthly means of pressure, temperature, and humidity from 1853 to 1874; but the noteworthy feature of the year's observations are the mean hourly values of the velocity and direction of the wind now published for the first time. These exhibit a well-marked daily period in the direction from E. 22° 15' S., the most southerly point at 4 A.M., to E. 7° 0' S. at 1 P.M., and thence back to E. 22° 15' S. at 4 A.M., the daily variation thus being 15° 15'. Equally marked is the diurnal variation in the velocity, the minimum 9.7 miles per hour occurring from 2 to 3 A.M., and the maximum 18.5 miles per hour from 1 to 2 P.M. Hence, as regards this part of the south-east trades, the influence of the sun during the day is to double the velocity of the wind and to impress upon it a more truly easterly direction.

IN an eighth contribution to meteorology Prof. Loomis deals with the origin and development of storms, in which he shows that the great American storms are not confined in their origin to any particular locality, half of them originating on or close to the Rocky Mountains, and more than two-thirds north of 36° N. lat. The first stage in their development is the formation of an area several hundred miles in diameter, over which the barometer differs little from 30.000 inches, with areas of high barometer on the east and west sides, often another to the north, and occasionally a fourth to southward. The mean height of these different high areas examined was 30.310 inches on the west and 30.420 on the east side, that on the east side being thus the greater; and the distance of each from the central area of nearly uniform pressure which they surround is generally about 1,000 miles. A

system of winds towards an intermediate or central point then sets in, resulting in a diminished pressure over the central area. The author supposes that the inflowing air escapes by an ascending current, carrying with it a large amount of vapour which as it is cooled is condensed into cloud and rain, and that the heat thus liberated further expands the air, thereby increasing the force of the inward movement of the wind. Rain is thus one of the conditions which increase the force of a storm. Prof. Loomis finds that an area of low barometer of considerable size may be formed and continue for several days with little or no rain, but in such cases the pressure did not fall so low as 29.250 inches. No storm of great violence has yet been found unaccompanied by a considerable fall of rain or snow. The general inward movement of the air towards a central area begins before any considerable precipitation of rain or snow has taken place. The easterly course of storms is considered to be occasioned by the general circulation of the atmosphere in that direction, and by the upward motion of the air taking place principally on the east side of the low centre as indicated by the position of the rain-areas. By this upward motion the air which presses in upon the east side of the low centre is prevented from restoring the equilibrium of pressure upon that side, and thus the low centre is steadily transferred toward the east, or the storm travels eastward. On the other hand, when the fall of rain or snow on the west side of the low centre is copious, widespread, and continued, the easterly progress of the storm is retarded, or arrested, or in some cases even retrogrades to westward, of which the storms of March 9-14, 1874, and January 1-18, 1875, were examples.

DR. WOJEIKOF sends to the Paris Exhibition new isobaric charts of the globe for January and July, which are rectifications of Buchan's isobaric charts, published in 1869, made by charting the large amount of fresh and fuller meteorological information collected since that time. Lake Baikal has recently been levelled, and its true height now ascertained to be 1,539 feet above the sea, instead of 1,342 feet, as given by Kropotkin. Correcting the barometrical observations for this height the mean pressure of this region in January is 30.630 inches, which is the maximum mean pressure for the globe at this season, and consequently 0.200 inch greater than was given in Buchan's chart. This extraordinarily high pressure in Eastern Siberia, which is 1.300 inch higher than that of Iceland at this season, is attributed by Dr. Wojeikof to the clear dry atmosphere of Siberia, and intense cold of the valleys and the high mountain barrier, which shuts off all communication, as regards the lower atmosphere, with the Pacific, where pressure in winter is low. A point of some interest brought out in the chart for July is the existence of two centres of low pressure controlling the wind systems of the Asiatic continent, the one being the Punjab and adjacent parts of Beloochistan, and the other the region around Lob-Nor. Dr. Wojeikof introduces an important feature into his charts in *not* tracing the isobaric lines over those portions of the globe which are at least 1,800 metres (5,906 feet) above the sea, some mountain-groups only being excepted. In this way the great plateau of Tibet, with its ramifications, is omitted, it being evident, for instance, that the winds of the Gangetic plains cannot be influenced by any differences that may obtain between the sea-level pressure there and that of the plains of Siberia, owing to the high, broad plateau of Tibet interposed between.

GEOGRAPHICAL NOTES

IN the course of the address which he recently delivered before the Geographical Society upon the subject of his travels on the western frontier of China, Capt. W. J. Gill, R.E., gave an interesting account of